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DE-A- 2 635 617
DE-A- 3 513 515
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GB-A- 2 148 128
US-A- 4 348 976

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Description

FIELD OF THE INVENTION

The following invention relates generally to an underwater diving apparatus which allows a person to swim underwater for extended periods of time without having to wear a compressed air tank as in scuba diving. The source of air in the form of a scuba type tank of compressed air is carried on a raft floating on the surface and is towed by the diver by means of an air line which extends from the raft to the diver and is attached to the diver by means of a harness.

BACKGROUND OF THE INVENTION

Curiosity and the desire to explore appear to be innate human characteristics. With respect to large bodies of water such as oceans or lakes, humans are confronted with severe obstacles when exploring because the environment is totally alien. Various devices have been created to make humans more adaptable to an underwater environment, albeit for limited periods of time. Examples include diving bells, diving suits, scuba systems and snorkelling equipment. While each of these devices provides access to the world below water, each has well known limitations.

United States Patent Number 4 348 976 shows a diving apparatus which is provided as a means for transporting a diver through water and which can be utilised as an air pump for supplying air to underwater divers linked to the apparatus by air lines.

The apparatus includes a floating vessel; a source of compressed gas; a gas line to an underwater diver; and a belt connecting an end of the line, remote from the source, to the diver.

The compressed gas source of US 4 348 976 differs from the gas source of the invention of the present application in a number of ways. For example, the gas source of US 4 348 976 is a relatively low pressure gas source when compared to the gas source of the present invention which operates at gas pressures comparable to a typical scuba diving apparatus. More importantly, the gas source of US 4 348 976 is dependent upon an internal combustion engine (gasoline engine) which is used to separately provide propulsion of the floating vessel and power for an air compressor supplying air to a "volume" tank comprising the gas source. Disadvantages of this apparatus are its complexity and cost.

SUMMARY OF THE INVENTION

The present invention is characterised over the apparatus of US 4 348 976 in that the floating vessel of the present invention is in the form of a lightweight raft and is provided with a harness means connecting an end of the line, remote from the source, to the diver; and the gas source, in the form of a scuba type tank of compressed gas normally carried on the back of a diver, is carried on the raft wherein, while the diver explores underwater, the raft is towed along and forces associated with such towing are dissipated by the harness means.

One of the perceived impediments that a newcomer encounters in scuba diving is the cumbersome nature of the diving equipment itself. Although the weight of compressed air tanks when carried on the back of the diver is offset by its buoyancy in the water, its bulk is not displaced. Thus, the presence of a scuba tank is somewhat deceptive because the presence of the scuba tank may be ignored due to its lack of weight but its bulk can provide clearance problems which may be forgotten by an inexperienced diver. The instant invention overcomes this difficulty by placing the compressed air tank on a raft and only an air line communicates with the diver.

The air line serves several important functions apart from providing the diver with air to breathe. First, it makes diving equipment less cumbersome. Second, the air line is tethered to the raft itself so that the raft follows the diver. Third, the air line is kept at a modest length, typically 20 feet. This limits both the depth to which the diver can go for obvious safety reasons and limits the distance the diver has to travel to return to the safety of the raft. Although it is relatively unlikely that the air line will become entrained in an underwater obstacle, even if this should happen the diver is sufficiently close to the surface and the rail to escape. A harness worn by the diver attaches the air hose to the raft and makes towing the raft by the diver effortless.

The raft itself serves other important functions apart from merely carrying the compressed air tank First, the raft is designed to be "self-bailing". Thus, the raft is not prone to taking on water caused for example by the wake of a boat. Second, the raft serves as a marker which alerts other water enthusiasts as to the presence of a diver in the immediate area. This minimizes the possibility of another boat's keel injuring a diver who is near the surface and within the draft depth of the nearby boat. Third, the raft includes a sight window on a bottom surface or deck of the boat. This provides the diver with information with respect to the prospective diving site. The raft also provides diver transportation to and from the diving site while the diver is

supported by the raft. No use of compressed air is needed while relocating to another site. These features add security and safety.

In sum, the instant invention provides substantive benefits derived from scuba diving with the relative freedom and enhanced safety beyond that which is afforded by snorkelling.

OBJECTS OF THE INVENTION

Accordingly, it is a primary object of this invention to provide a new and useful diving apparatus.

It is a further object of this invention to provide apparatus as characterized above which is extremely safe to use, durable in construction and lends itself to mass production techniques.

It is a further object of this invention to provide apparatus as characterized above which combines the benefits of scuba diving with even greater safety than that which is experienced when snorkelling.

A further object of this invention is to provide apparatus as characterized above which includes a harness worn by the diver, a gas line of compressed air attached to the harness and communicating with the diver through a mouth piece, the gas line attached to a source of compressed air carried on a raft, the life line tethered to a raft so that swimming by the diver tows the raft thereabong. The raft is configured so as to be self-bailing and includes a sight glass along the bottom wall of the raft to allow the diver to select the most appropriate terrain for exploration.

Viewed from one vantage point it is an object of the present invention to provide apparatus as characterized above which includes a light-weight raft, a source of compressed gas carried on the raft, a gas line from the source to an underwater diver, and a harness connecting an end of the line remote from the source to the diver thereby while the diver explores underwater, the raft is towed along and forces associated with towing are dissipated by the harness. The hydrodynamic shape of the raft and light weight of the inflatable pontoons facilitate this.

Viewed from a second vantage point, the instant invention contemplates as an object the provision of underwater diving apparatus in which a raft formed from a pair of outboard pontoons and interconnected by a membrane defined as a deck, stores a compressed gas container within a compartment on the deck of the raft, such that the compressed gas container depends from the deck, a gas line xtends from the container to the diver such that the harness on the diver distributes forces generated while the diver tows the hydrodynamically shaped raft.

Viewed from yet a further vantage point, it is an object of the present invention to provide an underwater diving apparatus in which a raft having a source of compressed gas includes a gas line extending from the source to the diver, the gas line is tethered to a leading portion of th raft and extends down to a harness connected to the gas line and worn by the diver which includes a strap which directs the gas line from the diver's lower back area and over a shoulder to conveniently feed the regulator to the diver's mouth for the admission of air therethrough.

These and other objects will be made manifest when considering the following detailed specification when taken in conjunction with the appended drawing figures.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

Figure 1 is a perspective of a top portion of the raft according to the present invention.

Figure 2 is a top plan view thereof with various compartments exposed for clarity.

Figure 3 is a side view of that which is shown in figures 1 and 2.

Figure 4 is a sectional view taken along lines 4-4 of figure 2.

Figure 5 is a perspective view of a bottom of the raft.

Figure 6 is a bottom view of the raft with the essential diving components shown along with the harness according to the present invention, the raft shown in phantom for purposes of clarity.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings now, wherein like reference numerals refer to like parts throughout the various drawing figures, reference numeral 10 (figure 6) is directed to the underwater diving apparatus according to the present invention. As shown, diving apparatus 10 includes two major components: a raft 20 and a harness 70.

With respect to the raft 20, figures 1-5 detail certain structural components. In its essence, the raft 20 includes two cylindrical pontoons 2 having an upswept "V" shaped nose 4 and a deck 14 extending between the two pontoons defining the raft. This configuration promulgates hydrodynamic efficiency and safety to be described.

More particularly, each cylindrical pontoon 2 includes an end wall 12 at a trailing portion of the raft 20, and each cylindrical pontoon 2 is disposed with respect to the other in spaced parallel configuration. The upswept nose 4 has a substantially V shaped profile when viewed from a top plan view (figure 2) and is formed integrally with the cylindrical pontoons 2. That is, the fabric forming the

pontoons and the nose along each side of the raft is cut from a single sheet of material and includes no seam at the intersection or transition 3 b tween the nose 4 and the pontoon cylindrical portion 2. This transition 3 necessitates very skilful pattern cutting and fabrication because this would be an area of logical stress where the nose sweeps upwardly. Had there been a seam this would be an area of weakness. The stern of the pontoons include circular end walls 12 providing a rearward air barrier. The bow portion of the raft comes somewhat to a point with the nose portion 4 declinated not only upwardly but inwardly. As shown in figure 4, each pontoon 2 connects at the bow portion and a barrier 8 is provided between the two pontoons along the longitudinal centre line of the raft thereby providing two air chambers for safety. A trailing portion of the raft reveals two reinforced areas 60 which support valves V allowing fluid communication with the interior of the pontoons 2.

A deck 14 is provided which spans between the two pontoons 2. As shown in figures 1 and 2 for example, the deck is formed as a membrane having a peripheral border which is attached to the pontoons by means of lacing 52 passing through an edge portion 4a, 2a of the pontoons and the membrane. Note that edge 4a is on a bottom of the raft while edge 2a is at the top. This provides a better support surface 14 for the diver. Eyelets 54 reduce the friction and chafing likely to occur at the areas of connection between the deck and pontoons. The deck 14 includes a forward portion 42 which is truncated and substantially "V" shaped and serves as a line storage area as will be explained. At an area of the deck 14 just forward the linear cylindrical pontoons 2 includes a window 48 is placed passing through the membrane deck 14. The window 48 is attached by a lacing 52 connected to a deckege 50. The diver when paddling on the water can look through the window 48 to select an appropriate dive area. Immediately aft the window 48, a pillow 16 is integrally formed with the deck 14 to provide comfort for the diver when using the raft. Trailing the pillow 16 and in fluid communication therewith, a series of air passageways extend the length of the deck. Each air passageway forming the deck 14 is interrupted by a seam press 18 which compartmentalizes the air contained within the deck such that only the pillow has a central crown area while the remainder of the deck is "flat", more accurately, a crenellated surface having no prominent central crown. Two valves V inflate the deck 14. One valve is at a bottom leading portion of the raft (FIG 5); the other (FIG 2) is near the rear edge of compartment 26.

A trailing portion of the deck 14 includes a cover 22 which overli s an air tank to be discussed. The cover 22 is pimanicaulty attached along one edge and is hinged open by means of male and female velcro strips 24 connected along another longitudinal edge ther of. Figures 2 and 4 depict a depressed compartment 26 within which a tank of compressed air is placed. As shown, the depressed compartment 26 includes a bottom wall 30, a rear wall 28, a front wall 32 and a pair of spaced side walls 31 thereby defining the compartment. In the preferred form of the invention, the compartment walls and cover 22 are formed from foam preferably closed cell. It is also preferred the walls defining the compartment have been sculpted such that the recess for receiving the tank 34 is complimental to the external configuration of the tank 34 so that there is negligible free space in the compartment for the tank to roll or move. Several intended benefits are inherent with this design.

First, placement of the compressed tank below the elevation of the pontoons lowers the centre of gravity of the raft providing a stable structure which is not only resistant to capsizing, but tends to be self-righting. Second, placement of the tank at a trailing portion of the raft adjusts the trim of the raft so that the trailing portion is at a lower elevation. This is further enhanced by having the nose 4 of the raft inclinated upwardly. Third, note the absence of a transom or rear wall transverse to the longitudinal axis of the raft. This allows the raft to be self-bailing and also easily boarded by the user. Since the tank is carried in a covered compartment 26 conforming to the external shape of the tank 34, the compartment will not receive or retain any appreciable amount of water.

Because of the tank compartment construction, air lines extending from the tank can pass through openings on the front wall 32 of the compartment 26 through eyelets 54. The tank 34 includes a two stage valve 36 allowing two lines to proceed forwardly under the raft deck 14 and therefore not interfere with the diver's activities. A gauge line 38 runs under the raft and through another opening terminating in the nose portion of the raft in a gauge "G". The gauge "G" is held in fixed position on one pontoon wall at a nose portion thereof by means of a velcro connection 24. Thus, the diver can know the air pressure within the tank 34 while oriented to look through the viewing window 48. The diver's feed line 40 passes through the deck 14 and into the nose portion of the raft where it is coiled for storage in the line storage area 42.

A top surface of the pontoons overlying the nose portion 4 includes a line front cover 44 formed from two pieces of membrane. Each cover 44 is of substantially triangular configuration having a line outlet 46 formed as an arcuate cutaway adjacent the bow 6 of the boat. The two portions defining the cover 44 can b unit d by means of velcro fastening 24 configured as an longate strip

along adjacent edges of the cover 44. Cover edge abutting the nose 4 are fixed to th nose. When the line 40 is to be stored, it is coiled under the cover 44 and therefore is less likely to become entrained because it is not depending from the raft when the diver is paddling.

The line 40 exits the forward portion of the raft through the line outlet 46 and is looped through a lanyard 66 at a leading portion of the raft. The line will then be deployed in a manner to be defined shortly.

The remaining details of the raft include a rope 56 attached on lateral outer faces of the pontoon portion 2. The rope 56 is connected to the pontoons 2 by means of D-Ring mounting pad 58 adhered to the side walls of the pontoons 2 in any known manner, such as gluing or heat pressing. The rope 56 is attached to the pads 58 through D-Rings 54 and allows the raft to be easily grasped by the diver upon ascent or descent and utilized to board the raft from aft end and for navigation when the diver is not paddling on the raft deck. A further pad 58 is carried on a leading portion or bow of the boat, this pad 58 includes an upwardly extending sleeve which is declinated rearwardly to receive a flag staff 62 which in turn, supports a flag 64. The flag and flag staff make the raft more readily visible to other boats who will proceed in the area immediately proximate the raft with greater care thereby providing greater safety for the diver.

Because the air line 40 passes through a velcro strap 24, it can tow the raft 20 as the diver swims below. The lanyard 66 can be used to tow the raft by another vehicle.

With reference to figure 6, the underwater diving apparatus 10 can be explained with respect to the relationship of the raft 20 and the associated harness 70 that the diver wears. As shown, the line 40 extending below the surface of the water communicates with a harness 70 which includes a waist belt 72 that circumscribes the diver. The waist belt 72 includes a girth adjuster 74 so that a free end of the belt can be pulled to accommodate various dimensioned people. The adjuster 72 is integrally formed with a biased catch 78 formed as prongs on opposed sides of the adjuster that fastens to a belt latch 76 carried on a remote extremity of the belt. The belt latch 76 receives the catch 78 by insertion of the catch 78 into the latch 76 according to the direction of the arrow "A" shown in figure 6. The latch 76 has two opposed side walls provided with openings 80 defining a receiver for the catch 78. The openings 80 receive the prongs of the biased catch 78 to hold the waist belt securely. By depressing the prongs of the catch 78 and pulling in a direction opposite from the arrow "A", the belt can be removed quickly.

The harness 70 also includes a shoulder belt 82 extending from a rear portion of the belt 72 and is to be looped over th shoulder of the wearer and is fastened to a forward portion of the belt near the belt latch 76. The shoulder strap 82 is provided with a strap adjuster 84 to vary the length of the shoulder strap to accommodate people of different dimensions.

Since the air line 40 is to communicate with a mouth piece regulator "R" for the diver and because the air line 40 is to tow the raft 20, the harness is constructed to support the air line in such a manner that the forces associated with towing the raft are not encountered by the mouth area of the diver but instead are dissipated along the person's body to make the tether to the raft hardly discernible. The air line 40 couples to a harness section of the air line 88 through a quick disconnect coupling 86 for safety. The harness air line 88 is first tethered to the shoulder strap 82 near where the shoulder strap joins the waist belt 72 at a lower back area of the diver. This back area is shown in figure 6 as being a portion opposite from the latch 76 and catch 78. A loop 90 supports the weight and forces exerted by the raft on the diver. In addition, a velcro strap 24 is provided up from the belt area on the shoulder strap 82 and tethers the harness air line 88. Interposed between the velcro strap 24 and the loop 90 is a chafe liner 92 configured as a rubber sleeve having a longitudinal slit 93 overlying the harness air line 88. Circumscribing the chafe liner 92 is a clamp 94 radially constructing the chafe line R 92. Thus, the clamp 94 and the chafe liner 92 provide limits in harness air line 88 motion between loop 90 and velcro 24 as a safety feature. An alternative would be to attach clamp 94 directly to line 88 and contrain axial movement via annular stops on either side of the clamp 94.

Assume that the line 40 is snagged in some manner. The presence of the clamp 94 assures that the regulator "R" will not be pulled from the mouth of the diver. This gives the diver sufficient time to explore the nature of the snag and take appropriate action. Since the air line 40 is contemplated as having a maximum length of approximately 20 feet, the diver has several options available. The diver can either unsnag the line, disconnect coupling 86 or release the harness and surface safely. Note further coupling 86 on the nose portion (FIG 2). This coupling allows a snagged line to be dropped if necessary. This coupling also allows two diving lines to be used if the coupling includes a "Y" adapter (line bigurcation). This apparatus would be helpful when training a diver, rescue operation, etc. Clearly, more than two lines could be provided if desired.

As an additional safety feature, it is proposed that a weight belt not be integrally formed with the harness. As shown in figur 6, a weight belt 96 having a free end 98 connects to a buckle 100 that includes a girth adjustment not too dissimilar from an auto seat belt. The weight belt 96 includes a plurality of weight pockets 102 within which weights "W" are carried. Removal allows the diver to proceed to the surface effortlessly.

In use and operation, the diver paddles to an appropriate area for underwater exploration as determined through the viewing window 48, checks that the tank has sufficient air through the gauge "G", dons the harness and weight belt, uses the air line 40 and proceeds to explore below the water with the raft following the diver as described. Moreover, having thus described the invention, it should be apparent that numerous structural modifications and adaptations may be resorted to without departing from the scope of the invention as defined hereinbelow in the claims.

Claims

1. Underwater diving apparatus comprising a floating vessel; a source of compressed gas; and a gas line to an underwater diver; characterised in that the vessel is in the form of a lightweight raft and is provided with a harness means connecting an end of the line, remote from the source, to the diver; and the gas source, in the form of a scuba type tab of compressed gas normally carried on the back of a diver, is carried on the raft wherein, while the diver explores underwater, the raft is towed along and forces associated with such towing are dissipated by the harness means.

2. Underwater diving apparatus according to claim 1, characterised in that the raft includes a pair of outboard pontoons interconnected by a membrane defining a deck wherein the source of compressed gas is carried on the raft such that it depends from the deck and the deck remains unobstructed to support a diver thereon.

3. Underwater diving apparatus according to claims 1 or 2, characterised in that the raft is inflated with air thereby making it buoyant.

4. Underwater diving apparatus according to any preceding claim, characterised in that the gas source includes a plural stage valve.

5. Underwater diving apparatus according to claim 4, characterised in that the gas line extending from the gas source to a diver passes through said plural stage valve.

6. Underwater diving apparatus according to claim 5, characterised in that a mouthpiece regulator is provided between a diver and the gas line.

7. Apparatus according to any preceding claim characterised in that the raft includes a compartment within which the compressed gas source is disposed and which is in depending relationship with respect to a deck area of the raft, whereby the weight of the compressed gas source lowers the centre of gravity of the raft and enhances the raft's ability to resist capsizing and promulgates self-righting

8. Apparatus according to claim 7, characterised in that a trailing portion of the raft is open ended and the compartment is disposed adjacent thereto, thereby adjusting the trim of the raft and providing a self-bailing raft.

9. Apparatus according to claims 7 or 8, characterised in that the compartment has a recessed configuration complementary with an external configuration of the compressed gas source,

a cover seals access to the compartment, and

the source includes first and second lines extending therefrom under the raft and entering a nose portion of the raft through the deck, thereby providing a diver occupant area unobstructed by hose lines.

10. Apparatus according to claim 9, characterised in that the nose portion includes an area for receiving a length of line communicating with the compressed air source,

a cover overlying the air line area includes an arcuate opening adjacent the nose of the raft allowing the line to pass therethrough and thence downwardly into the water,

the nose portion further including a sight window to allow the diver a view of the underlying underwater terrain.

11. Apparatus according to claim 10, characterised in that the raft is formed from first and second pontoons having a rear portion of substantially elongate cylindrical dimension,

a nose portion angled upwardly and inwardly to form a substantially "V" shaped nose, thereby defining a hydrodynamic shape for stable, in-line towing,

the deck includes a plurality of inflated passageways interrupted by a pattern of pressed seams, thereby minimizing any forma-

tion of a central crown with respect to the deck,

a pillow is interposed between th sight glass and seam pressed areas for providing support of the diver when viewing through the sight glass, and

said harness means includes first and second loops adjacent a lower back area of the diver directing the air line over a shoulder of the diver and providing resistance to a tendency for removal of a regulator from a mouth of the diver at a terminal portion of the air line, should the air line encounter a snag.

Patentansprüche

1. Unterwassertauchgerät umfassend ein schwimmendes Fahrzeug; eine Druckgasquelle; sowie eine Gasleitung zu einem unter Wasser befindlichen Taucher;
dadurch **gekennzeichnet,** daß
das Fahrzeug in Form eines gewichtsleichten Flosses ausgebildet und mit einer Geschirrvorrichtung versehen ist, welche das von der Quelle entfernte Ende der Leitung mit dem Taucher verbindet; und daß die Gasquelle in Form eines normalerweise auf dem Rücken eines Tauchers getragenen Druckgastanks auf dem Floß angeordnet ist, wobei das Floß während der Unterwassererkundung des Tauchers mitgezogen wird und die mit diesem Mitziehen verbundenen Kräfte durch die Geschirrvorrichtung aufgenommen und verteilt werden.

2. Unterwassertauchgerät nach Anspruch 1,
dadurch **gekennzeichnet,** daß
das Floß ein Paar Außenbord-Schwimmkörper aufweist, die durch eine ein Deck bildende Membran miteinander verbunden sind, wobei die Druckgasquelle auf dem Floß so angeordnet ist, daß sie von dem Deck herabhängt und das Deck zur Aufnahme eines Tauchers auf ihm frei bleibt.

3. Unterwassertauchgerät nach Anspruch 1 oder 2,
dadurch **gekennzeichnet,** daß das Floß mit Luft aufgeblasen ist und dadurch schwimmfähig ist.

4. Unterwassertauchgerät nach einem der vorhergehenden Ansprüche,
dadurch **gekennzeichnet,** daß
die Gasquelle ein Mehrstufenventil umfaßt.

5. Unterwassertauchgerät nach Anspruch 4,
dadurch **gekennzeichnet,** daß
die von der Gasquelle zu einem Taucher verlaufend Gasleitung durch das g nannte Mehrstufenventil verläuft.

6. Unterwassertauchgerät nach Anspruch 5,
dadurch **gekennzeichnet,** daß
zwischen einem Taucher und der Gasleitung ein Mundstück mit Regler vorgesehen ist.

7. Gerät nach einem der vorhergehenden Ansprüche,
dadurch **gekennzeichnet,** daß
das Floß ein Abteil aufweist, in welchem die Druckgasquelle angeordnet ist und das bezüglich einem Deckbereich des Flosses herabhängend angeordnet ist, derart daß das Gewicht der Druckgasquelle den Schwerpunkt des Flosses nach unten verlagert und so die Kenterstabilität des Flosses erhöht und das Selbstaufrichtvermögen erhöht wird.

8. Gerät nach Anspruch 7,
dadurch **gekennzeichnet,**
daß ein hinteres oder Heckteil des Flosses mit offenem Ende ausgebildet und das Abteil benachhart hierzu angeordnet ist, wodurch die Trimmung des Flosses eingestellt und ein selbstlenzendes Floß geschaffen wird.

9. Gerät nach den Ansprüchen 7 oder 8,
dadurch **gekennzeichnet,**
   - daß das Abteil eine Ausnehmungskonfiguration komplementär mit einer Außenkonfiguration der Druckgasquelle besitzt,
   - daß eine Abdeckung den Zugang zu dem Abteil verschließt, und
   - daß die Druckgasquelle erste und zweite Leitungen umfaßt, welche von der Druckgasquelle ausgehend unter dem Floß verlaufen und durch das Deck in einen Nasen- oder Bugbereich des Flosses eintreten, derart daß ein von Schlauchleitungen unbehinderter Aufenthaltsbereich für einen Taucher geschaffen wird.

10. Gerät nach Anspruch 9,
dadurch **gekennzeichnet,**
   - daß der Nasen- oder Bugbereich einen Bereich zur Aufnahme einer mit der Druckgasquelle in Verbindung stehenden Leitungsstrecke aufweist,
   - daß eine den Luftleitungsbereich überdeckende Abdeckung eine bogenförmige Öffnung benachbart der Nase bzw. dem Bug des Flosses aufweist, durch welche di Leitung hindurchtreten und von dort abwärts ins Wasser verlaufen kann
   - und daß der Nasen- bzw. Bugbereich des weiteren ein Sichtfenster aufweist,

das dem Taucher ein Sicht auf das darunter befindliche Unterwasserterrain gestattet.

11. Gerät nach Anspruch 10, dadurch **gekennzeichnet,**
- daß das Floß aus einem ersten und einem zweiten Schwimmkörper mit einem jeweiligen rückwärtigen Teil von im wesentlichen länglicher zylindrischer Abmessung gebildet wird,
- mit einem aufwärts und einwärts abgewinkelten Nasen- oder Bugteil zur Bildung eines im wesentlichen V-förmigen Bugs, derart daß eine hydrodynamische Form für stabiles An-der-Leine-Schleppen bzw. -Treideln definiert wird,
- daß das Deck mehrere aufgeblasene Kanäle, die durch ein Muster von Preßsäumen bzw. -nähten unterbrochen sind, aufweist, derart daß jegliche Bildung einer zentralen Überhöhung bezüglich dem Deck vermieden wird,
- daß zwischen dem Sichtfenster und den mit Preßsäumen versehenen Bereichen ein Kissen vorgesehen ist, als Unterlage für den Taucher beim Blicken durch das Sichtfenster, und
- daß die Geschirrvorrichtung eine erste und eine zweite Schleife benachbart einem unteren Rückenbereich des Tauchers aufweist, welche die Luftleitung über eine Schulter des Tauchers führen und im Fall einer Verhakung der Luftleitung der Tendenz zur Loslösung eines Regulators aus dem Mund eines Tauchers am Ende der Luftleitung einen Widerstand entgegensetzen.

Revendications

1. Appareil de plongée sous-marine comprenant un récipient flottant ; une source de gaz comprimé ; et une conduite de gaz arrivant à un plongeur sous-marin ; caractérisé en ce que le récipient a la forme d'un radeau léger et en ce qu'il est équipé d'un moyen de harnais reliant une extrémité de la conduite, éloignée de la source, au plongeur ; et en ce que la source de gaz, sous forme de bouteille de gaz comprimé du type pour plongeur normalement portée sur le dos du plongeur ; est supporté sur le radeau dans lequel, pendant que le plongeur explore les fonds marins, le radeau est remorqué et les forces liées à ce remorquage sont dissipées par le moyen de harnais.

2. Appareil de plongée sous-marine selon la revendication 1, caractérisé en ce que l radeau comprend deux pontons extérieurs reliés entr eux par une membran constituant un pont dans lequel la source de gaz comprimé est transportée sur le radeau de façon à être solidaire du pont et le pont reste libre pour supporter un plongeur qui y est installé.

3. Appareil de plongée sous-marine selon la revendication 1 ou 2, caractérisé en ce que le radeau est gonflé d'air, ce qui le rend flottant.

4. Appareil de plongée sous-marine selon l'une quelconque des revendications précédentes, caractérisé en ce que la source de gaz comprend une vanne à plusieurs étages.

5. Appareil de plongée sous-marine selon la revendication 4, caractérisé en ce que la conduite de gaz placée entre la source de gaz et un plongeur traverse ladite vanne à plusieurs étages.

6. Appareil de plongée sous-marine selon la revendication 5, caractérisé en ce qu'un régulateur d'embout est monté entre le plongeur et la conduite de gaz.

7. Appareil selon l'une quelconque des revendications précédentes, caractérisé en ce que le radeau comprend un compartiment à l'intérieur duquel est placée la source de gaz comprime et qui se trouve en relation de dépendance avec la zone de pont du radeau, de façon que le poids de la source de gaz comprimé abaisse le centre de gravité du radeau et renforce l'aptitude du radeau à résister au chavirage et à favoriser le redressement automatique du radeau.

8. Appareil selon la revendication 7, caractérisé en ce qu'une partie arrière du radeau est ouverte à l'extrémité et en ce que le compartiment est placé en position adjacente à cette extrémité, de façon à ajuster l'assiette du radeau et à créer un radeau à stabilisation automatique.

9. Appareil selon la revendication 7 ou 8, caractérisé en ce que le compartiment possède une configuration en creux complémentaire d'une configuration extérieur de la source de gaz comprimé,

un accès au compartiment fermé par un couvercle, et

en ce que la source comprend une première et seconde conduites partant de la sour-

ce et passant sous l radeau et pénétrant dans une partie avant du radeau à travers le pont, de façon à offrir au plongeur occupant un espace qui n'est pas encombré par les conduites.

10. Appareil selon la revendication 9, caractérisé en ce que la partie avant comprend une zone destinée à recevoir un tronçon de conduite communiquant avec la source d'air comprimé,

un couvercle recouvrant la zone de la conduite d'air comprenant une ouverture cintrée adjacente à l'avant du radeau, ce qui permet à la conduite de traverser cette zone et de là de descendre dans l'eau,

la partie avant comprenant en outre une fenêtre de visée pour permettre au plongeur de voir la zone sous-marine sous-jacente.

11. Appareil selon la revendication 10, caractérisé en ce que le radeau est constitué à partir du premier et du second pontons, en ayant une partie arrière de forme cylindrique allongée de dimension notable,

une partie avant inclinée vers le haut et vers l'intérieur pour former un avant sensiblement en forme de "V" de façon à créer une forme hydrodynamique favorisant un remorquage stable, en ligne,

le pont comprenant une pluralité de passages gonflés interrompus par une configuration de coutures comprimées, en minimisant ainsi toute formation d'une couronne centrale par rapport au pont.

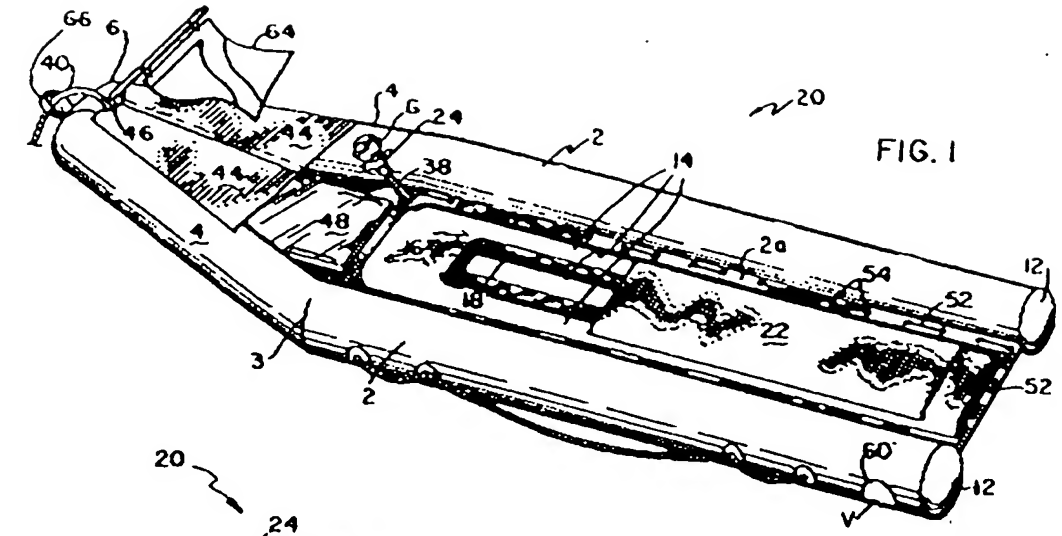

FIG. 1

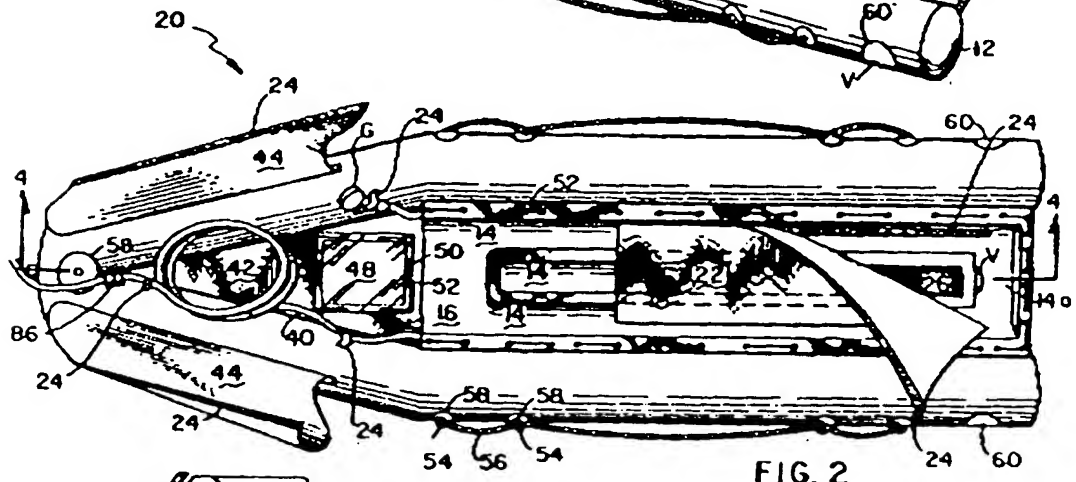

FIG. 2

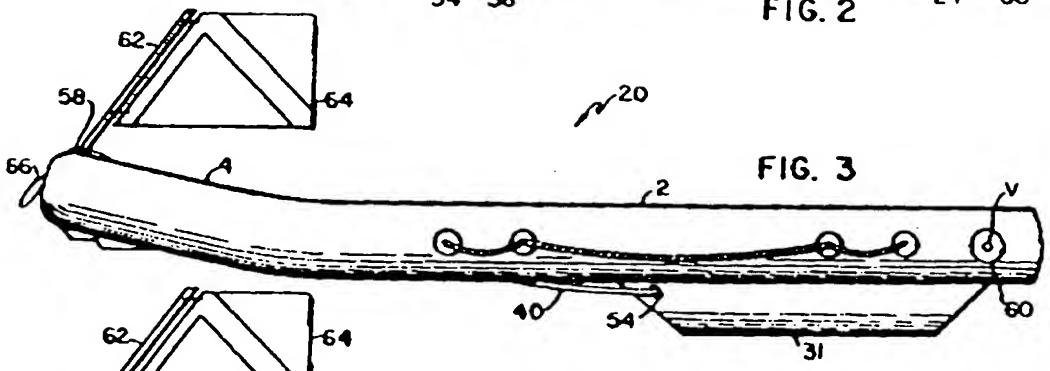

FIG. 3

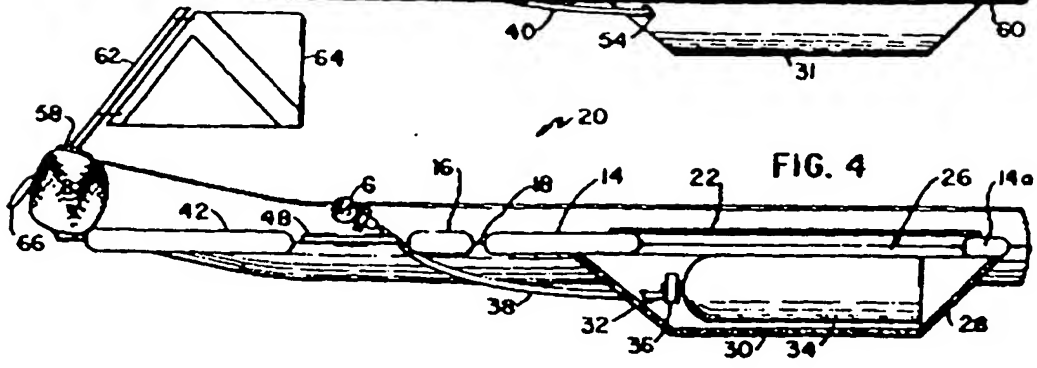

FIG. 4

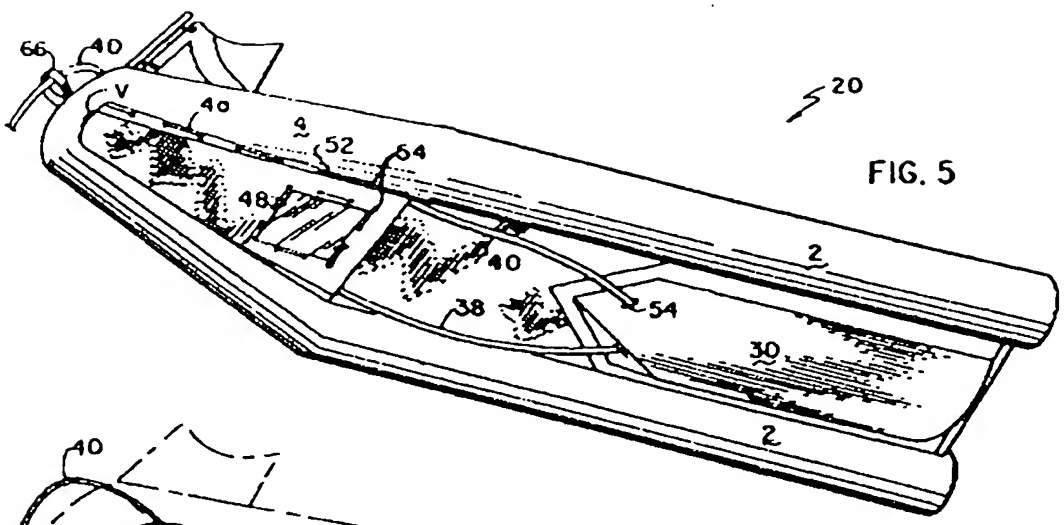
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FIG. 5

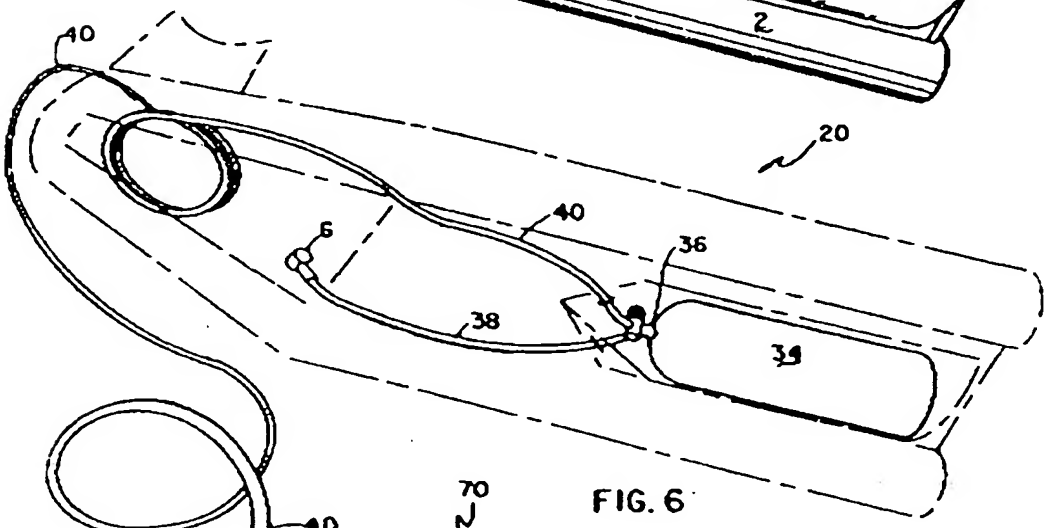
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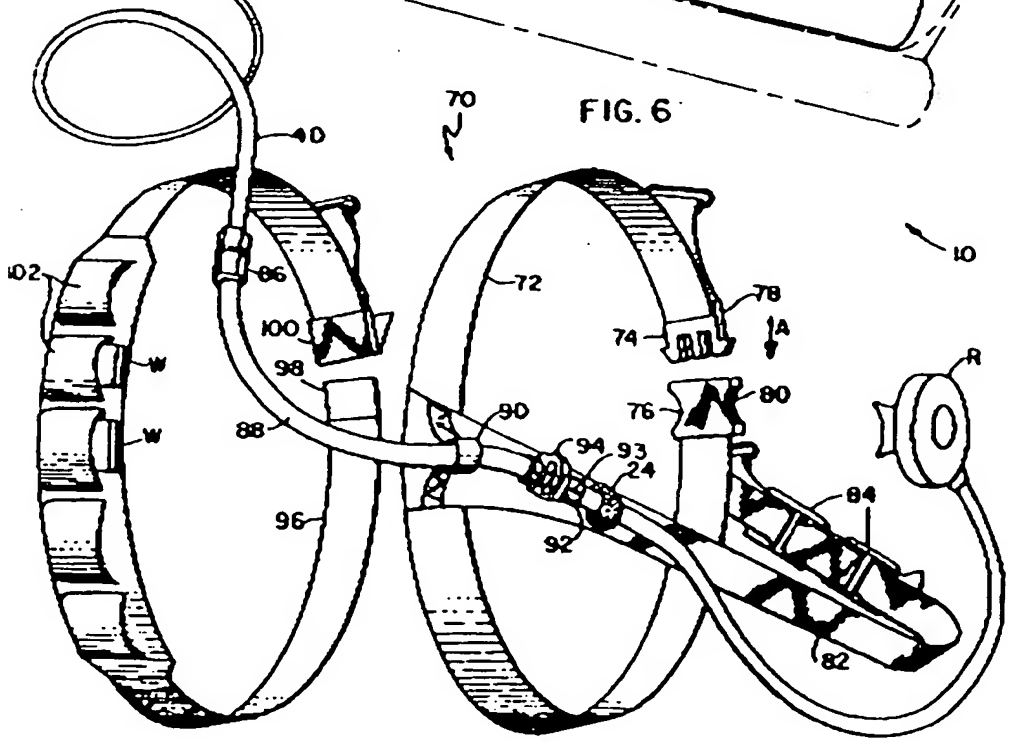
FIG. 6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